

METHYL CHLORIDE

Methyl chloride is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 74-87-3

CH₃Cl

Molecular Formula: CH₃Cl

Methyl chloride is a colorless gas which compresses to a colorless liquid. It has a chloroform-like odor and a sweet taste. It is slightly soluble in water; miscible with chloroform, ether, and glacial acetic acid; and soluble in alcohol (Merck, 1983).

Physical Properties of Methyl Chloride

Synonyms: chloromethane; Arctic; monochloromethane

Molecular Weight:	50.49
Boiling Point:	-23.7 °C
Melting Point:	-97 °C
Flash Point:	below 32 °F open cup
Vapor Density:	2.47 (air = 1)
Density/Specific Gravity:	0.9159 at 20/4 °C (water = 1)
Vapor Pressure:	3,800 mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	0.91
Water Solubility:	303 ml/100 ml at 20 °C
Conversion Factor:	1 ppm = 2.07 mg/m ³

(Howard, 1990; Merck, 1983; Sax, 1987; Sax, 1989)

SOURCES AND EMISSIONS

A. Sources

Methyl chloride is used to manufacture silicones, agrichemicals, methyl cellulose, quaternary amines, butyl rubber, and tetraethyl lead. It has also been detected in tobacco smoke, turbine exhaust, wood, field, and backyard burning emissions. Methyl chloride is also used as a solvent and a propellant. It is formed as a byproduct of chlorination of drinking water and sewage effluent (HSDB, 1991).

The primary stationary sources that have reported emissions of methyl chloride in California

are manufacturers of communications equipment, commercial printing, and colleges and universities (ARB, 1997b).

B. Emissions

The total emissions of methyl chloride from stationary sources in California are estimated to be at least 2,200 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Methyl chloride is naturally formed from volcanoes, plant volatiles, and brush and forest fires. It is also produced in seawater by the reaction of methyl iodide with chloride ions (HSDB, 1991).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of methyl chloride. However, the United States Environmental Protection Agency (U.S. EPA) has compiled ambient air data from several urban and suburban locations throughout the United States from 1975-86. The data had a mean ambient concentration of 1.55 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and a range of concentrations from 0 to 12.0 $\mu\text{g}/\text{m}^3$ (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

No information about the natural occurrence of methyl chloride was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Methyl chloride exists in the atmosphere in the gas phase. The dominant atmospheric loss process for methyl chloride is by reaction with the hydroxyl radical. Based on this reaction, the atmospheric half-life and lifetime of methyl chloride is estimated to be 0.6 years and 0.9 years, respectively (Atkinson, 1994). The product of this reaction is formyl chloride (Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

Although methyl chloride is reported as being emitted in California from stationary sources, no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to methyl chloride are inhalation, ingestion, and dermal contact.

Non-Cancer: Methyl chloride is a central nervous system depressant. Acute inhalation exposure to methyl chloride in humans may result in convulsions and coma. Other related effects include headache, dizziness, vision disturbances, fatigue, confusion, nausea, and vomiting. Methyl chloride may sensitize the heart to the arrhythmogenic effects of epinephrine. Symptoms may be delayed. No information is available regarding the chronic effects of methyl chloride in humans. Mice, chronically exposed to methyl chloride, developed adverse effects in the liver, kidney, spleen, and brain. The U.S. EPA has both the Reference Concentration (RfC) and oral Reference Dose (RfD) under review (U.S. EPA, 1994a).

No studies were found regarding adverse reproductive or developmental effects in humans. Male rats and mice exposed to methyl chloride by inhalation exhibited testicular lesions. Delayed fetal development was noted in rats exposed to the same concentration of methyl chloride that results in maternal toxicity (U.S. EPA, 1994a).

Cancer: The U.S. EPA is currently reviewing its carcinogenicity assessment for methyl chloride. Kidney tumors were reported in male mice. The U.S. EPA has classified methyl chloride in Group C: Possible human carcinogen, based on limited animal and no human evidence (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified methyl chloride in Group 3: Not classifiable as to human carcinogenicity (IARC, 1987a).

